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ESR Study of Y2SiO5:Nd^{143} Isotopically Pure Impurity Crystals for Quantum Memory

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Abstract

© 2017, Springer-Verlag Wien.Two Y2SiO5 single crystals doped with 0.001 at.% of the 143Nd3+ ion (sample I containing the only 28Si isotope) and (sample II with the natural abundance of silicon isotopes) were studied using magnetic resonance methods. The spin–spin and spin–lattice relaxation times were measured at 9.7 GHz between 4 and 10 K. It is established that three relaxation processes describe temperature dependences of the spin–lattice relaxation for both crystals. They are one-phonon, two-phonon Raman and two-phonon Orbach–Aminov relaxation processes. It is established that temperature dependence of spin–spin relaxation time differs for different hyperfine components of the electron paramagnetic resonance spectrum of neodymium ions and depends on the kind of the neodymium isotope (143Nd or 145Nd).

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